

## CLAIMS

What is claimed is:

- 1 1. A method to look up a plurality of data items indexed by a vector of indices,  
2 the method comprising:  
3 generating a second vector of indices in a vector register, each index of the  
4 second vector of indices being one of a first vector of indices, at least  
5 one index in the first vector of indices being replicated as a plurality  
6 of duplicated indices in the second vector of indices; and  
7 looking up simultaneously a first vector of data items from a plurality of look  
8 up tables using the second vector of indices.
- 1 2. A method as in claim 1 wherein the plurality of duplicated indices in the  
2 second vector of indices are grouped together for looking up respectively a  
3 plurality of bit segments of one data item in the first vector of data items.
- 1 3. A method as in claim 2 wherein the second vector is generated by at least  
2 one of:  
3 a) a vector merge operation; and  
4 b) a vector permutation operation.
- 1 4. A method as in claim 1 wherein a group of indices in the first vector of

2 indices is replicated as a plurality of duplicated groups of indices in the  
3 second vector of indices.

1 5. A method as in claim 4 wherein the second vector of indices is generated by  
2 a vector permutation operation.

1 6. A method as in claim 4 further comprising:  
2 storing a plurality of groups of data items in the first vector of data items into  
3 different vectors respectively, the plurality of groups of data items  
4 being looked up using the plurality of duplicated groups of indices  
5 respectively.

1 7. A method to look up a plurality of data items indexed by a plurality of  
2 vectors of indices, the method comprising:  
3 generating a second vector of indices in a vector register, each index of the  
4 second vector being one index of a plurality of vectors of indices, at  
5 least one index in each vector of the plurality of vectors of indices  
6 being replicated as an index in the second vector; and  
7 looking up simultaneously a first vector of data items from a plurality of look  
8 up tables using the second vector of indices.

1 8. A method as in claim 7 wherein at least one index in one vector of the  
2 plurality of vectors of indices are replicated as a plurality of duplicated

3 indices in the second vector.

1 9. A method as in claim 8 wherein the plurality of duplicated indices in the  
2 second vector of indices are grouped together for looking up respectively a  
3 plurality of bit segments of one data item in the first vector of data items.

1 10. A method as in claim 7 wherein a group of indices in each vector of the  
2 plurality of vectors of indices are replicated respectively as a group of  
3 indices in the second vector of indices.

1 11. A method as in claim 10 further comprising:  
2 storing a plurality of groups of data items in the first vector of data items into  
3 different vectors respectively, each of the plurality of groups of data  
4 items being looked up using a group of indices in the second vector  
5 of indices which is replicated from a group of indices in one vector of  
6 the plurality of vectors of indices.

1 12. A machine readable media containing executable computer program  
2 instructions which when executed by a digital processing system cause said  
3 system to perform a method to look up a plurality of data items indexed by a  
4 vector of indices, the method comprising:  
5 generating a second vector of indices in a vector register, each index of the  
6 second vector of indices being one of a first vector of indices, at least

7 one index in the first vector of indices being replicated as a plurality  
8 of duplicated indices in the second vector of indices; and  
9 looking up simultaneously a first vector of data items from a plurality of look  
10 up tables using the second vector of indices.

1 13. A media as in claim 12 wherein the plurality of duplicated indices in the  
2 second vector of indices are grouped together for looking up respectively a  
3 plurality of bit segments of one data item in the first vector of data items.

1 14. A media as in claim 13 wherein the second vector is generated by at least one  
2 of:  
3 a) a vector merge operation; and  
4 b) a vector permutation operation.

1 15. A media as in claim 12 wherein a group of indices in the first vector of  
2 indices is replicated as a plurality of duplicated groups of indices in the  
3 second vector of indices.

1 16. A media as in claim 15 wherein the second vector of indices is generated by  
2 a vector permutation operation.

1 17. A media as in claim 15 wherein the method further comprises:  
2 storing a plurality of groups of data items in the first vector of data items into

3 different vectors respectively, the plurality of groups of data items  
4 being looked up using the plurality of duplicated groups of indices  
5 respectively.

1 18. A machine readable media containing executable computer program  
2 instructions which when executed by a digital processing system cause said  
3 system to perform a method to look up a pluralities of data items indexed by  
4 a plurality of vectors of indices, the method comprising:  
5 generating a second vector of indices in a vector register, each index of the  
6 second vector being one index of a plurality of vectors of indices, at  
7 least one index in each vector of the plurality of vectors of indices  
8 being replicated as an index in the second vector; and  
9 looking up simultaneously a first vector of data items from a plurality of look  
10 up tables using the second vector of indices.

1 19. A media as in claim 18 wherein at least one index in one vector of the  
2 plurality of vectors of indices are replicated as a plurality of duplicated  
3 indices in the second vector.

1 20. A media as in claim 19 wherein the plurality of duplicated indices in the  
2 second vector of indices are grouped together for looking up respectively a  
3 plurality of bit segments of one data item in the first vector of data items.

- 1 21. A media as in claim 18 wherein a group of indices in each vector of the  
2 plurality of vectors of indices are replicated respectively as a group of  
3 indices in the second vector of indices.
- 1 22. A media as in claim 21 wherein the method further comprises:  
2 storing a plurality of groups of data items in the first vector of data items into  
3 different vectors respectively, each of the plurality of groups of data  
4 items being looked up using a group of indices in the second vector  
5 of indices which is replicated from a group of indices in one vector of  
6 the plurality of vectors of indices.
- 1 23. A processing system to look up a plurality of data items indexed by a vector  
2 of indices, the system comprising:  
3 means for generating a second vector of indices in a vector register, each  
4 index of the second vector of indices being one of a first vector of  
5 indices, at least one index in the first vector of indices being  
6 replicated as a plurality of duplicated indices in the second vector of  
7 indices; and  
8 means for looking up simultaneously a first vector of data items from a  
9 plurality of look up tables using the second vector of indices.
- 1 24. A processing system as in claim 23 wherein the plurality of duplicated







3 items into different vectors respectively, each of the plurality of  
 4 groups of data items being looked up using a group of indices in the  
 5 second vector of indices which is replicated from a group of indices  
 6 in one vector of the plurality of vectors of indices.

1 34. A processing system to look up a plurality of data items indexed by a vector  
 2 of indices, the system comprising:  
 3 a vector register file comprising a plurality of vector registers;  
 4 a vector processing unit coupled to the vector register file, the vector  
 5 processing unit comprising a vector look up unit adapted to look up a  
 6 vector of data items simultaneously, the vector processing unit:  
 7 generating a second vector of indices in a vector register in the vector  
 8 register file, each index of the second vector of indices being one of a  
 9 first vector of indices, at least one index in the first vector of indices  
 10 being replicated as a plurality of duplicated indices in the second  
 11 vector of indices; and  
 12 looking up simultaneously a first vector of data items from a plurality of look  
 13 up tables using the second vector of indices in the vector look up unit.

1 35. A processing system as in claim 34 wherein the plurality of duplicated  
 2 indices in the second vector of indices are grouped together for looking up  
 3 respectively a plurality of bit segments of one data item in the first vector of  
 4 data items.

- 1 36. A processing system as in claim 35 wherein the second vector is generated  
2 by the vector processing unit executing at least one of:  
3 a) a vector merge operation; and  
4 b) a vector permutation operation.
- 1 37. A processing system as in claim 34 wherein a group of indices in the first  
2 vector of indices is replicated as a plurality of duplicated groups of indices in  
3 the second vector of indices.
- 1 38. A processing system as in claim 37 wherein the second vector of indices is  
2 generated by a vector permutation operation.
- 1 39. A processing system as in claim 37 wherein the vector processing unit stores  
2 a plurality of groups of data items in the first vector of data items into  
3 different vectors respectively, the plurality of groups of data items being  
4 looked up using the plurality of duplicated groups of indices respectively.
- 1 40. A processing system to look up a pluralities of data items indexed by a  
2 plurality of vectors of indices, the system comprising:  
3 a vector register file comprising a plurality of vector registers;  
4 a vector processing unit coupled to the vector register file, the vector  
5 processing unit comprising a vector look up unit adapted to look up a

6                   vector of data items simultaneously, the vector processing unit:  
7           generating a second vector of indices in a vector register in the register file,  
8           each index of the second vector being one index of a plurality of  
9           vectors of indices, at least one index in each vector of the plurality of  
10          vectors of indices being replicated as an index in the second vector;  
11          and  
12          looking up simultaneously a first vector of data items from a plurality of look  
13          up tables using the second vector of indices in the vector look up unit.

1   41.   A processing system as in claim 40 wherein at least one index in one vector  
2          of the plurality of vectors of indices are replicated as a plurality of duplicated  
3          indices in the second vector.

1   42.   A processing system as in claim 41 wherein the plurality of duplicated  
2          indices in the second vector of indices are grouped together for looking up  
3          respectively a plurality of bit segments of one data item in the first vector of  
4          data items.

1   43.   A processing system as in claim 40 wherein a group of indices in each vector  
2          of the plurality of vectors of indices are replicated respectively as a group of  
3          indices in the second vector of indices.

1 44. A processing system as in claim 43 wherein the vector processing unit stores  
2 a plurality of groups of data items in the first vector of data items into  
3 different vectors respectively, each of the plurality of groups of data items  
4 being looked up using a group of indices in the second vector of indices  
5 which is replicated from a group of indices in one vector of the plurality of  
6 vectors of indices.